

Guidelines for lumbar spine radiography in acute low back pain: effect of implementation in an accident and emergency department

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SUMMARY

Guidelines for lumbar spine radiography were agreed by consultation between staff in the radiology, accident and emergency and neurosurgical departments of a large teaching hospital. Study of 322 consecutive patients over an eight month period showed that the proportion of patients referred for radiography was reduced from 48.4% to 27.2% following introduction of the guidelines ($p=0.0002$). Successful use of such guidelines requires cooperation between clinical and radiological staff and frequent review of performance.

Low back pain is one of the commonest causes of attendance at accident and emergency departments. Many of these patients are referred for radiographic examination of the lumbar spine, but in most cases no useful information is provided¹⁻⁵. Guidelines for such referrals have been published⁶ and their use has been recommended by the National Radiological Protection Board⁷. The purpose of this study was to develop and introduce our own more detailed guidelines, as compliance is most likely to be achieved when staff are responsible for their development and introduction⁸.

METHODS

Details of patients presenting with low back pain to the accident and emergency department over the preceding six months were retrieved retrospectively from the departmental computer. For the next two months the records of all patients presenting with acute low back pain were retained prospectively by the clerical staff. The junior medical staff were not made aware of either this or the preliminary data retrieval described above. The aim was to establish the practice of the current junior staff in the department and to use this data as a baseline for the subsequent study.

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TABLE I
Criteria for lumbar spine radiography

<i>Criterion</i>	<i>Number to be recorded on request form</i>
Trauma	1
Possible serious pathology:	
Night pain worse than day pain	2
Constant pain unrelieved by bedrest (>2 weeks)	3
Thoracic pain	4
History of malignancy	5
Weight loss	6
Pyrexia	7
Kyphosis (not long standing)	8
Age <20 years or >55 years	9
<i>(NB 2-9 Consider sedimentation rate !)</i>	
Orthopaedic referral	10
Other (specify)	11

The guidelines were defined by the authors and based on the known natural history of low back pain and the results of investigation (table 1) ^{1-5, 9, 12}. Two further criteria were included, one for patients being referred to the orthopaedic clinic (which was not participating in the study) and one for any specific reason which the medical staff felt would justify radiography. At a meeting of the authors and all the junior medical staff in the accident and emergency department, the results of the preliminary retrospective six month review of current practice were presented. This was followed by a teaching session which covered history taking and examination of patients presenting with low back pain and interpretation of lumbar spine radiographs. The importance of minimising exposure to radiation was also stressed. The proposed guidelines and their method of introduction were then explained and any queries answered.

The guidelines were then prominently displayed throughout the accident and emergency department. All doctors were required to justify requests for lumbar spine radiography by recording the number of the applicable criterion (or criteria). In the case of criterion 11, the reason for referral was recorded on the patient's record. The radiographers were instructed not to accept a request for radiography if these details were not provided. The five months of the study comprised months 2-6 of the junior doctors' six month attachment to the department in order to ensure continuity of staff throughout. The results were presented to the accident and emergency staff at the end of the study period. The study was continued for a further three months in order to gauge acceptance by a different set of junior doctors.

TABLE II

Radiographic findings in patients presenting with acute low back pain: retrospective six month review.

	<i>Number</i>	
Patients presenting	445	100%
Referred for radiography	336	75%
Normal	221	50%
Degenerative changes	77	17%
Fracture	26	6%
Lytic or sclerotic lesion	4	1%
Spondylolisthesis	8	2%
Other (spondylolysis, transitional vertebra congenital anomalies)	0	0%

RESULTS

Over the six month period prior to the studies 336 patients with low back pain (75%) were referred for radiography (table 2). Twenty-six patients were referred because of trauma and had a fracture. Other significant abnormalities were found in only twelve patients, eight with spondylolisthesis and four with lytic or blastic lesions: these represented 1.8% and 0.9% respectively of all patients. Purely degenerative changes were considered not significant in view of their poor correlation with symptoms and lack of impact on patient management^{3, 5, 13, 14}.

TABLE III

Radiographic findings before and after introduction of guidelines.

	<i>Before</i>	<i>After</i>
	<i>Number (%)</i>	<i>Number (%)</i>
Patients presenting	128 (100%)	184 (100%)
Referred for radiography	62 (48.4%)	50 (27.2%)
Normal	38 (29.7%)	35 (19.0%)
Degenerative changes	15 (11.7%)	9 (4.9%)
Fracture	9 (7%)	4 (2.2%)
Lytic or sclerotic lesion	0	1 (0.6%)
Other (see table 1)	0	1 (0.6%)

The results of introduction of the guidelines are presented in Table 3. During the initial two months of the study, 48% of patients were referred for radiographic examination. Following introduction of the protocol, only 27% were referred. This reduction was significant (X^2 with Yates' correction = 13.9, $p = 0.0002$). The majority of male patients were aged 21-54 years, and female patients more than 55 years. Closer analysis suggested that the number referred had already started to fall during the initial two month period before the guidelines had been introduced, and that in the last month of the study (month three of the second group of doctors studied), the referral rate rose to virtually its pre-protocol level.

If trauma is excluded, the incidence of radiological findings suggestive of tumour or infection was less than 1%. Only one such case had been seen during the formal prospective study period. Spondylolisthesis was seen in 1.8% of patients during the initial six month period but it is unlikely that this finding influenced acute patient management.

DISCUSSION

Most cases of acute low back pain are mechanical in aetiology and symptoms will resolve with simple conservative measures¹⁵. Suspected prolapsed intervertebral disc should be investigated using myelography, CT or MRI if surgery is being considered⁹. When there is no history of trauma, the role of plain radiographs in initial management is to exclude the presence of metastatic or inflammatory disease which may require more active intervention^{9, 15-17}. A detailed history, sedimentation rate and isotope bone scan are much more discriminating than straight X-rays in this context²².

There is a low incidence of such abnormalities on lumbar spine radiographs in this group of patients. Liang calculated a 0.2% chance³ and Nachemson a 1 in 2500 chance¹³ of detecting significant pathological change. Waddell described criteria for identifying these patients based on clinical findings⁹ and Deyo successfully applied guidelines to 621 patients without missing any cases of significant spinal disease⁵. More recently, the Royal College of Radiologists have provided guidelines for patient selection for radiographic examination⁶. Adoption of such guidelines could achieve both financial savings and a reduction in population exposure to ionising radiation^{18, 19}. A large proportion of patients fall into the 20-55 year old age group, many of whom would not be referred for radiography using our guidelines.

We decided to base the indications for radiography on the clinical history and symptoms rather than on physical signs. The history has long been recognised as the most important discriminator in this context^{12, 20} and intra- and inter-observer variation is less likely²². The criteria were derived from a simultaneous study by one of the authors on the management of low back disorders²⁰. The junior doctors found the guidelines easy to use and particularly appreciated the tutorials which were given at their launch.

The initial fall in referral for radiography which occurred before the guidelines were brought into use was felt to be due to news of the survey leaking out despite our attempt to prevent this. It is also notable that the effects of the guidelines began to reduce especially during the period of duty of the second set of junior doctors. This problem has been encountered by others and highlights the need for constant reinforcement²¹. Referral rates can be easily recorded over further

short periods and should be discussed in combination with practical teaching as in our study.

Success in reducing referrals for radiography must not be at the cost of loss of diagnostic sensitivity. If trauma is excluded, less than 1% of findings were likely to affect acute management, so it is not possible to assess the sensitivity of our guidelines in the detection of these abnormalities. A very large study would be required to achieve statistical validity. Deyo, using clinical guidelines did not miss any significant pathology in 621 patients⁵. Good communication with patients has been shown to be more important than special investigations in achieving patient satisfaction with medical care¹¹. Guidelines based on simple findings in the clinical history can significantly reduce referral rates for lumbar spine radiography, but regular reinforcement is required to maintain their effects.

REFERENCES

1. Rockey P H, Tompkins R K, Wood R W, Wolcott B W. The usefulness of X-ray examinations in the evaluation of patients with back pain. *J Fam Pract* 1978; **7**: 455-65.
2. Halpin S F S, Yeoman L, Dundas D D. Radiographic examination of the lumbar spine in a community hospital: an audit of current practice. *Br Med J* 1991; **303**: 813-5.
3. Scavone J G, Latshaw R F, Rohrer V. Use of lumbar spine films: statistical evaluation at a university teaching hospital. *JAMA* 1981; **246**: 1105-8.
4. Liang M, Komaroff A L. Roentgenograms in primary care patients with acute low back pain: a cost effectiveness analysis. *Arch Intern Med* 1982; **142**: 1108-12.
5. Deyo R A, Diehl A K. Lumbar spine films in primary care: current use and effects of selective ordering criteria. *J Gen Intern Med* 1986; **1**: 20-25.
6. Royal College of Radiologists. Making the best use of a department of radiology: guidelines for doctors. London, Royal College of Radiologists, 1989.
7. Patient dose reduction in diagnostic radiology. National Radiological Protection Board. London, HMSO, 1990.
8. Smith T. In search of consensus. *Br Med J* 1991; **302**: 800.
9. Waddell G. An approach to backache. *Br J Hosp Med* 1982; **28**: 187-219.
10. Guyer R D, Collier R R, Ohnmeiss D D et al. Extrasosseous spinal lesions mimicking disc disease. *Spine* 1988; **13**: 328-31.
11. Deyo R A, Diehl A K. Patient satisfaction with medical care for low back pain. *Spine* 1986; **11**: 28-30.
12. Mathew B, Norris D, Hendry D, Waddell G. Artificial intelligence in the diagnosis of low back pain and sciatica. *Spine* 1988; **13**: 168-72.
13. Nachemson A. The lumbar spine, an orthopaedic challenge. *Spine* 1976; **1**: 59-71.
14. Frymoyer J W, Newberg A, Pope M H et al. Spine radiographs in patients with low back pain. *J Bone Jt Surg* 1984; **66A**: 1048-55.
15. Frymoyer J W. Back pain and sciatica. *New Engl J Med* 1988; **318**: 291-300.
16. McCall I W, Butt W P. The radiological diagnosis of low back pain. *Curr Orthop* 1987; **1**: 375-82.
17. Gibson M, Zoltie N. Radiography for back pain presenting to accident and emergency departments. *Arch Emerg Med* 1992; **9**: 28-31.
18. Royal College of Radiologists Working Party. A multicentre audit of hospital referral for radiological investigation in England and Wales. *Br Med J* 1991; **303**: 809-12.

19. Chisholm R. Guidelines for radiological investigations. *Br Med J* 1991; **303**: 797-8.
20. Mathew B M. Computer aided management of low back disorders. ChM thesis, Bristol University, 1992.
21. McNally E, de Lacey G, Berman L, Welch T, Lovell P. Radiological guidelines: can they have a sustained effect? Royal College of Radiologists and Faculty of Radiologists Annual Scientific Meeting, Dublin 1991.
22. McCombe P F, Fairbank J C T, Cockersole B L et al. Reproducibility of physical signs in low back pain. *Spine* 1989; **14**: 908-18.

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